REMARKS

Claim 12 has been canceled. Claims 1-11 and 13 and new Claims 14 to 22 are active in the present application. Reconsideration is respectfully requested.

Applicants' representative wishes to thank Examiner Niland for the helpful and courteous interview of April 21, 2004. As a result of the discussion, it is believed that the issues in the case have been clarified and that the prosecution of the application has been materially advanced.

The present invention relates to a process for preparing an aqueous dispersion of inorganic particles.

Claim Amendments

Claim 1 has been amended in order to clarify the meaning of the claim, as well as to improve its form.

New Claim 19 is supported by the text at page 13, lines 39-40, while new Claims 20-21 are supported by the text at page 14, lines 12 and 13. New Claim 22 is supported by the text at page 21, line 12. Entry of the new claims and the several amendments to the original claims is respectfully requested.

Claim Rejection, 35 USC 101

Claim 12 has been canceled in favor of new Claims 14-18, thereby obviating the issue raised under 35 USC 101. Withdrawal of the rejection is respectfully requested.

Claim Rejection, 35 USC 112, 2nd Paragraph

The issue raised with respect to Claim 1 is believed obviated by amendment to the claims whereby the meaning of the composite particles is clarified. Withdrawal of the rejection is respectfully requested.

The issue raised with respect to the term "obtainable" is obviated by the amendments to Claims 10 and 13.

Invention

As claimed, the present invention is directed to a process for preparing an aqueous dispersion of composite particles composed of addition polymer and finely divided inorganic solid, by polymerizing a mixture of ethylenically unsaturated monomers dispersely distributed in an aqueous medium by free-radical aqueous emulsion polymerization by means of at least one free-radical polymerization initiator in the presence of at least one dispersely distributed, finely divided inorganic solid and at least one dispersant. In the process a) the aqueous dispersion of said at least one inorganic solid obtained is stable in that it has an initial solids concentration of ≥1% by weight, based on the aqueous dispersion of said at least one solid, and still contains in dispersed form one hour after its preparation more than 90 % by weight of the originally dispersed solid and its dispersed solid particles have a weight-average diameter ≤ 100 nm; b) the dispersed particles of said at least one inorganic solid exhibit a non-zero electrophoretic mobility in an aqueous standard potassium chloride solution at a pH which corresponds to the pH of the aqueous reaction medium at the beginning of the emulsion polymerization; and c) the mixture of ethylenically unsaturated monomers of the polymerization medium contains > 0 and ≤ 4 % by weight, based on its overall amount, of at least one ethylenically unsaturated monomer A. This monomer A is either i) at least one acid group and/or its corresponding anion containing monomer, if the

dispersed particles of said at least one inorganic solid have an electrophoretic mobility with a positive sign under the abovementioned conditions, or ii) at least one amino, amido, ureido or N–heterocyclic group and/or its ammonium derivatives alkylated or protonated on the nitrogen containing monomer, if the dispersed particles of said at least one inorganic solid have an electrophoretic mobility with a negative sign under the above-mentioned conditions.

Prior Art Rejection

Claims 1, 3-7 and 9-13 stand rejected based on 35 USC 102(b) as anticipated by Solc, U. S. Patent 4,609,608. This ground of rejection is respectfully traversed.

The Solc patent, as stated in the abstract, discloses a dispersion of colloidal size particles of non-oxidized metal that are encapsulated in a hydrophobic polymer such as a copolymer of styrene and an acrylate ester. In the polymerization technique of the reference, aqueous emulsion polymerization of a mixture of water immiscible unsaturated monomers is conducted in a medium containing an appropriate initiator, as well as a surfactant or emulsifier, and particles of inorganic substance. If desired, the polymerization medium may also contain a small amount of water soluble unsaturated monomer, with it being critical, however, that the amount of the water soluble monomer must not be such as to render the resulting polymer soluble in water (col 4, lines 15-17). However, the reference is completely silent concerning an important aspect of the present invention, whereby in the polymerization process, the mixture of monomers to be polymerized must contain from > 0 to ≤ 4 % by weight of a water soluble unsaturated monomer A such that, in the event the inorganic particles selected have an electrophoretic mobility with a positive sign (as determined by the method disclosed in the specification and mentioned in Claim 1), the monomer A that is chosen is one that contains at least one acid group and/or it corresponding anion. On the other hand, if the inorganic particles selected have an electrophoretic mobility with a negative

sign, the monomer A that is chosen is one that contains at least one amino, amido, ureido or N-heterocyclic group and/or its ammonium salt derivatives alkylated or protonated on the nitrogen atom. In fact, there is no disclosed relationship whatever between the electrophoretic mobility of inorganic particles and the amount and type of water soluble unsaturated monomer selected. Still further, there is no teaching whatever in the patent of electrophoretic mobility of inorganic particles and that it is of some significance to the polymerization process of the reference. In fact, the single Example of the patent only shows the suspension of iron particles in a copolymer prepared by copolymerizing the two water-insoluble monomers of styrene and butyl acrylate in the presence of emulsifier! There is no disclosure in the example embodiments of the presence of a water-soluble, specifically of an acid or an amino, ureido or N-heterocyclic group containing monomer in the monomer mixture that is polymerized. There is nothing in the example embodiment of the reference that links electrophoretic mobility of dispersed iron particles with the selection of water soluble monomer. It is acknowledged that the patent in the discussion of the paragraph bridging columns 3 and 4 mentions that water-soluble monomer in a very minor amount may be incorporated in a monomer mixture, and specifically indicates a styrene/butyl acrylate combination that is copolymerized in the presence of 0.01 to 3 wt % acrylic acid. However, there is nothing in the patent which links such a monomer combination to the type of metal particles employed for which no electrophoretic mobility is disclosed. Accordingly, the reference is completely silent as to the important limitations regarding electrophoretic mobility of colloidal inorganic particles and the type of water soluble unsaturated monomer selected and therefore, the reference fails as an anticipatory reference.

Applicants also point out that because of the manner in which the dispersion of polymer encapsulated inorganic particles of the invention is prepared, the product obtained is stable, without the need for a surfactant or emulsifier in the dispersion. The same is not true

of the reference where inorganic dispersions are prepared in the presence of surfactants or emulsifiers.

With respect to the matter of stability, Example 1 and Comparative Examples 1 and 2 are instructive. In Example 1 a dispersion of silicon dioxide particles is prepared in which the particles are encapsulated with a polymer prepared by copolymerizing n-butyl acrylate and styrene with a small amount of 2-(N,N,N-trimethylammonium)ethyl acrylate chloride. The results of the polymerization are a product of the invention as discussed on page 27 of the specification. Note that upon centrifugation of the dispersed encapsulated particles, the particles were removed from the product supernatant liquid. On the other hand, in the repetition of the same experiment of Example 1 as Comp. Ex 1, which did not contain the water soluble 2-(N,N,N-trimethylammonium)ethyl acrylate chloride monomer of Example 1, the resulting particle dispersion was cloudy and no raspberry-shaper composite particles were found. Moreover, centrifugation gave no sedimentation of dispersed particles. In the case of Comp Ex 2, the experiment of Ex 1 was conducted, but the water soluble monomer was changed to a different type, i.e., the Na salt of 4-styrenesulfonic acid. Unacceptable results similar to those of Comp. Ex 2 were obtained. Accordingly, in light of the above discussion it is believed that the cited reference does not anticipate the invention as claimed and withdrawal of the rejection is respectfully requested.

Claims 1 and 3-13 stand rejected based on 35 USC 103(b) as anticipated by Solc, U. S. Patent 4,409,608. This ground of rejection is respectfully traversed.

Applicants traverse the obviousness ground of rejection for the same reasons as discussed above. The patent simply does not suggest important limitations in the presently claimed invention. Withdrawal of the rejection is respectfully requested.

Claims 1-7 and 9-13 stand rejected based on 35 USC 103(b) as anticipated by Solc nee Hajna, U. S. Patent 4,421,660. This ground of rejection is respectfully traversed.

It is noted that the cited patent is of the original grandparent application upon which the Solc patent, discussed above, is based. The patent contains additional disclosure matter in which the scope of inorganic particles that are dispersed is expanded from metal particles to inorganic pigments of some oxides and carbonates and even phosphates. Although column 3 of the patent discloses the possible use of water soluble monomers in small amounts for copolymerization with water insoluble monomers, including a preferred combination of styrene and butyl acrylate with a small amount of acrylic acid, there is absolutely no discussion of any connection between the type of electrophoretic mobility of inorganic particles employed in a given formulation and the necessity of using a certain type of water soluble monomer in a relatively small amount if a stable dispersion of inorganic particles in an aqueous medium is to be obtained. Certainly, the examples of the patent do not improve upon the indefiniteness of the disclosure because the examples only disclose the copolymerization of styrene and butyl acrylate with the several types of pigments shown in Table 1. The Solc nee Hajna patent therefore does not show or suggest the present invention as claimed for the same reasons discussed above. Withdrawal of the rejection is respectfully requested.

Claims 1-13 stand rejected based on 35 USC 103(b) as anticipated by Solc nee Hajna, U. S. Patent 4,421,660. This ground of rejection is respectfully traversed.

Applicants traverse the obviousness ground of rejection for the same reasons as discussed above with respect to the Solc patent. The patent simply does not suggest the important limitations regarding electrophoretic mobility of the inorganic particles chosen in any give polymerization reaction and the type of water soluble monomer selected. Moreover, the dispersion of the reference must contain a surfactant or emulsifier if it is to be stable. Withdrawal of the rejection is respectfully requested.

It is now believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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